PowerPlant Chemistry® The Journal of All Power Plant Chemistry Areas

International Edition ISSN 1438-5325 January Volume 7 (2005), No. 1

Abstracts

Research and Service Experience with Environmentally Assisted Cracking of Low-Alloy Steel

John Hickling, Hans-Peter Seifert, and Stefan Ritter

Environmentally assisted cracking (EAC) of carbon and low-alloy steels has been identified as a possible degradation mechanism for pressure vessels and piping in nuclear power plants. Selected aspects of research and service experience with cracking of these materials in high-temperature water are reviewed, with special emphasis on the primary pressure boundary in boiling water reactors. The main factors controlling EAC susceptibility under reactor conditions are discussed with regard to both crack initiation and crack growth. The adequacy and conservatism of the relevant engineering criteria for component design and disposition of detected or postulated flaws are evaluated in the context of recent research results, e.g., on the effects of so-called "ripple loading" or of water chemistry transients. Finally, the relevant operating experience over the last 30 years is briefly summarized and compared with the background knowledge which has been accumulated in more recent laboratory experiments. Some of the insights gained in this work may also be of value in improving understanding and prediction of the EAC behavior of carbon and low-alloy steels in certain fossil plant components, if appropriate allowances are made for differences in temperature and water chemistry.

PowerPlant Chemistry 2005, 7 (1)

Corrosion Behavior of Boiler Materials during Long-Term Layup of a Fossil Unit

Masayoshi Hirano, Satoshi Itaba, Takao Minami, Li-Bin Niu, and Hiroshi Takaku

The applicability of the electrochemical corrosion potential (ECP) method as an online corrosion monitoring technique for boiler equipment during long-term layup in fossil units was experimentally investigated for boiler equipment materials. It was found that the ECPs of all materials tested show stable values for a few hundred hours after the test, and that oxide films formed under AVT (all-volatile treatment) conditions show a good stability in the subsequent ECP measurements. Under conditions of the presence of hydrazine, the corrosion potential of STB410 carbon steel shifts to the noble side, showing high corrosion resistance. The results obtained by the ECP method are in good agreement with those of the corrosion immersion test. The temporary decrease in the corrosion potential due to the addition of hydrazine to the water may result from effects of both the reducing reaction of oxide films and the decomposition of hydrazine. The results in this work suggest that the ECP method may be effective for the corrosion monitoring of boiler equipment materials. Based on the fundamental results obtained, it is expected that the corrosion of boiler equipment during the layup period can be detected by the ECP method.

PowerPlant Chemistry 2005, 7 (1)

Corrosion Behaviour of and Damage to Copper Alloy Power Cycle Components

Siegfried Köhler and Mechthild Müller

At temperatures > 60 °C, the corrosion behaviour of copper alloys is determined above all by the oxygen content and the temperature of the medium. The prevailing corrosion mechanisms include dezincification, pitting corrosion, stress corrosion cracking, ammonia grooving, and sulphide-induced corrosion. In addition, intergranular corrosion may occur in aluminium brass.

PowerPlant Chemistry 2005, 7 (1)

Modeling of Diffusion Phenomenon of Liquid Poison in Shutdown System #2 of PHWRs
Subrata Dutta, Shantanu Das, Arun Ramachandra Kandalgaonkar, Padmanabha Iyer Suryanarayanan, Bibhuranjan Basudev Biswas, and Vadakke Kodakara Prabharakan Unny

The diffusion phenomenon of poison solution (gadolinium nitrate) in connection with the secondary shutdown system of pressurized heavy water reactors is studied with a simple approach of one-dimensional macro-modeling and application of the experimental results to arrive at actual power plant operational specifications. The results obtained by mass balance macro-dynamics and simple laboratory experiments tally with the power plant operational requirements. Obtaining Fick's constant from the results confirms the validity of the model. A new interpretation of Fick's constant is given for better understanding of the diffusion process.

PowerPlant Chemistry 2005, 7 (1)

Condenser Performance – A Critical Issue for Plant Chemists
Brad Buecker

Along with the boiler, the steam condenser is one of the two largest heat exchangers in a steam generating power plant. Waterside scaling or fouling, or excess air in-leakage on the steam side, will seriously impair heat transfer, which in turn increases fuel requirements and costs. Power plant chemists must keep track of condenser performance, especially as it relates to cooling water chemical treatment. Failure or poor operation of chemical feed systems will initiate fouling that often can only be removed by a unit shutdown and mechanical cleaning. Prompt detection of air in-leakage upsets is also important to maintain proper condenser efficiency. This article outlines a practical method for condenser performance monitoring that the author has used with excellent success.

PowerPlant Chemistry 2005, 7 (1)

2005's Scientific and Technical Contributions: Papers in English

As every year, the January issue closes with abstracts of all the articles published in this journal in the last year. Back issues of our journal are – with few exceptions – still available; interested parties can receive PDF files of all articles by e-mail. The order forms may be downloaded from our homepage.

PowerPlant Chemistry 2005, 7 (1)

Discussion

The PowerPlant Chemistry® editor has received an e-mail with comments on the articles
Miroslaw Gruszkiewicz and Albert Bursik:
Degassed Conductivity – Comments on an Interesting and Reasonable Plant Cycle Chemistry Monitoring Technique
Part 1: Degassing of Low-Molecular-Weight Organic Acids in Technical Degassed Cation Conductivity Monitors
PowerPlant Chemistry **2005**, 6(3), 177–184
Part 2: Degassing of Carbon Dioxide in Technical Degassed Cation Conductivity Monitors and Temperature Conversion of the Cation Conductivity Measured at Nearly 100 °C to 25 °C
PowerPlant Chemistry **2005**, 6(5), 279–289

This e-mail and the reply from the first author are presented.

PowerPlant Chemistry 2005, 7 (1)